

What is Claimed is:

- 1 1. A system for sensing and compensating for at least one error signal, the system
- 2 comprising:
 - 3 an acoustic pick-up device having a first microphone disposed at a first distance
 - 4 from a desired acoustic source, and a second microphone disposed at a
 - 5 second distance from the desired acoustic source, each of the first
 - 6 microphone and the second microphone
 - 7 receiving acoustic signals generated from the desired acoustic source, and
 - 8 in response, transducing the acoustic signals into audio signals;
 - 9 a position estimation circuit coupled to receive the audio signals from the first
 - 10 microphone and the second microphone, and adapted to produce therefrom
 - 11 the error signal representing an estimate of the acoustic pick-up device being
 - 12 positioned differently than intended with respect to the desired acoustic
 - 13 source; and
 - 14 a controller using the error signal to compensate for the acoustic pick-up device
 - 15 being positioned differently than intended by providing the audio signals
 - 16 from at least one of the first microphone and the second microphone to an
 - 17 output.
- 1 2. The system according to Claim 1, further comprising an indicator utilizing the
- 2 error signal to generate an indication of the acoustic pick-up device being positioned
- 3 differently than intended.

1 3. The system according to Claim 1, wherein the error signal is determined after
2 the audio signals are received by the position estimation circuit.

1 4. The system according to Claim 1, wherein the first microphone and the second
2 microphone are both omnidirectional microphones.

1 5. The system according to Claim 4, further comprising a noise canceling
2 microphone signal adapted from a difference between the audio signals received from the
3 first microphone and the audio signals received from the second microphone.

1 6. The system according to Claim 1, wherein the controller includes a switch
2 transferring the audio signals from one of the first and the second microphones to the
3 output.

1 7. The system according to Claim 1, wherein the controller includes a switch
2 transferring a combined signal to the output, the combined signal generated from a
3 difference between the audio signals received from the first microphone and the audio
4 signal received from the second microphone.

1 8. The system according to Claim 1, wherein the controller includes:
2 a device adapted to produce a combined signal based on the audio signals
3 received from the first and the second microphones, wherein the error signal
4 is used to select the combined signal to be transmitted to the output.

1 9. The system according to Claim 8, wherein the device comprises a summing
2 unit.

1 10. The system according to Claim 1, wherein the position estimation circuit
2 comprises a sensor capable of determining the acoustic pick-up device being positioned
3 differently than intended.

1 11. The system according to Claim 1, wherein the controller includes:
2 a programmable phase shift network adapted to produce a range of phase shifts in
3 the audio signals from the second microphone; and
4 a device producing a combined signal based on those signals being phase shifted
5 and on the audio signals received from the first microphone, the device being
6 further capable of transferring the combined signal to the output.

1 12. The system according to Claim 11, wherein the device comprises a summing
2 unit.

1 13. The system according to Claim 1, wherein the first microphone is disposed
2 closer to the desired acoustic source than the second microphone.

1 14. The system according to Claim 1, wherein the position estimation circuit
2 comprises:
3 a device determining whether the desired acoustic source is operational; and
4 coupled to the device, a sensor determining that the acoustic pick-up device is
5 positioned differently than intended.

1 15. The system according to Claim 14, wherein the audio signals from at least
2 one of the first microphone and the second microphone are provided to the output when
3 the acoustic source is operational and when the sensor determines that the acoustic pick-
4 up device is positioned differently than intended according to a predetermined threshold
5 that is exceeded.

1 16. The system according to Claim 14, wherein the position estimation circuit
2 further comprises:

3 a first circuit determining progressive levels of the acoustic pick-up device being
4 positioned differently than intended with respect to the desired acoustic
5 source; and
6 a second circuit determining a corresponding phase shift based on a particular one
7 of the progressive levels determined, said corresponding phase shift being
8 introduced with the audio signals received from the second microphone to
9 produce delayed signals, the delayed signals being subtracted from the audio
10 signals received from the first microphone with a result provided to the
11 output.

1 17. The system according to Claim 16, wherein first circuit comprises a multi-
2 level comparator, and the second circuit comprises a state machine coupled to the multi-
3 level comparator.

1 18. The system according to Claim 16, wherein the corresponding phase shift
2 causes a directional response of a combination of the first and second microphones to

3 include one of a figure eight pattern, a cardioid pattern, a hypercardioid pattern, and an
4 omnidirectional pattern.

1 19. A system for controlling a directional response of at least one of a first
2 microphone and a second microphone, the system comprising:
3 first microphone means disposed at a first distance from a desired acoustic source;
4 second microphone means disposed at a second distance from the desired acoustic
5 source, each of the first microphone means and the second microphone
6 means receiving acoustic signals generated from the desired acoustic source,
7 and in response thereto, transducing the acoustic signals into audio signals;
8 position estimation means coupled to receive the audio signals from the first and
9 second microphone means, the position estimation means being adapted to
10 produce therefrom an error signal representing an estimate of the first and
11 second microphone means being positioned differently than intended with
12 respect to the desired acoustic source; and
13 control means using the error signal to compensate for the first and second
14 microphone means being positioned differently than intended by providing
15 the audio signals from at least one of the first and second microphone means
16 to an output.

1 20. The system according to Claim 19, wherein said control means adjusts a polar
2 pattern of the audio signals received from the first and second microphone means to
3 provide the audio signals to the output.

1 21. The system according to Claim 20, wherein the audio signals provided to the
2 output include noise canceling as a result of a combination of the audio signals from the
3 first and second microphone means.

1 22. A method of controlling a directional response of at least one of a first and
2 second microphones, the method comprising:

3 receiving acoustic signals generated by a desired acoustic source at a first
4 microphone;
5 receiving the acoustic signals at a second microphone;
6 in response, the first and second microphones each transducing the acoustic
7 signals respectively received into audio signals;
8 detecting an error signal amongst the audio signals, the error signal representing
9 an estimate of the first and second microphones being positioned differently
10 than intended with respect to the desired acoustic source;
11 using the error signal to select the directional response corresponding to at least
12 one of the first and second microphones in order to compensate for the first
13 and second microphones being positioned differently than intended; and
14 providing the audio signals associated with the directional response selected to an
15 output.

1 23. The method according to Claim 22, wherein the audio signals provided to the
2 output are a result of noise canceling generated by a difference between the audio signals
3 associated with the first microphone and the audio signals associated with the second
4 microphone.

1 24. The method according to Claim 22, further comprising
2 activating an indicator in response to receiving the error signal to indicate the first
3 and second microphones being positioned differently than intended with
4 respect to the desired acoustic source.

1 25. The method according to Claim 22, wherein the first and second microphones
2 each comprises an omnidirectional microphone.

1 26. The method according to Claim 22, further comprising:
2 determining progressive levels of the first and second microphones being
3 positioned differently than intended with respect to the desired acoustic
4 source;
5 determining a corresponding phase shift based on a particular one of the
6 progressive levels associated with the error;
7 introducing the corresponding phase shift with the audio signals associated with
8 the second microphone to produce delayed signals;
9 providing at the output the delayed signals combined with the audio signals
10 associated with the first microphone.

1 27. The method according to Claim 22, wherein the directional response
2 comprises one of a figure eight pattern, a cardioid pattern, a hypercardioid pattern, and an
3 omnidirectional pattern.

1 28. A method of sensing and compensating for an error, the method comprising:

2 receiving acoustic signals generated by a desired acoustic source at a first
3 microphone;
4 receiving the acoustic signals at a second microphone;
5 in response, the first and second microphones each transducing the acoustic
6 signals respectively received into audio signals;
7 detecting an error signal amongst the audio signals associated with the first and
8 second microphones, the error signal representing an amount of unintended
9 mispositioning of the first and second microphones relative to the desired
10 acoustic source; and
11 using the error signal to selectively provide the audio signals from at least one of
12 the first and second microphones to an output in order to compensate for the
13 mispositioning.

1 29. The method according to Claim 28, wherein the audio signals provided to the
2 output include noise canceling as a result of a combination of the first and second
3 microphones.

1 30. The method according to Claim 28, wherein using the error signal to
2 selectively provide the audio signals from at least one of the first and second
3 microphones to an output comprises adjusting a directional response of at least one of the
4 first and second microphones.

1 31. The method according to Claim 30, wherein the directional response
2 comprises one of a figure eight pattern, a cardioid pattern, a hypercardioid pattern, and an
3 omnidirectional pattern.

1 32. The method according to Claim 30, wherein the directional response
2 comprises one of a figure eight pattern, and an omnidirectional pattern.

1 33. The method according to Claim 28, wherein detecting an error signal
2 comprises:
3 determining whether the desired acoustic source is operational; and
4 determining whether the first and second microphones are mispositioned relative
5 to the desired acoustic source.

PCT/EP2014/05330